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Scalable Infrastructure to Achieve Broadband Goals for Schools

- **Investing in Scalable Broadband Connections**: The Quilt believes it is important to set national broadband capacity goals for our country's schools and libraries to emphasize the importance of affordable broadband access in preparing students to compete in a 21st century global environment. Based on the experience of the Research and Education Networks (R&E Networks), the key to putting schools and libraries on a sensible path toward these goals is to invest in scalable infrastructure that is able to expand in a cost-effective way to match the demand for higher capacity broadband connections over time by individual schools and libraries.

- **Determining the Best Long-Run Approach:** Capacity requirements will undoubtedly grow for each school and library over time as our national goal pushes toward ever higher capacities in the future. Where utilization data and financial analysis supports it, fiber optic solutions are most likely to offer the best long-run approach because fiber networks can be upgraded to add additional capacity in the future simply by changing the electronics. In the case of fiber, the E-Rate program should not distinguish between eligible costs for lit versus dark fiber. To determine where school or library ownership of fiber is a feasible alternative, a return on investment calculation showing how the capital investment ameliorates annual bandwidth costs should be part of the analysis. Several Quilt members use a 3-5 year ROI on fiber builds to justify the capital investment. Having said this, the E-Rate program should not pick winners and losers among technologies arbitrarily. Applicants should have the flexibility to use the best and most cost-effective technology for each location. Upfront capital investments now will allow program dollars to go further while providing the flexibility to scale to meet the demands of educators and students into the future. Where cost effective to do so, program funding should support necessary modulating electronics necessary to enable scalable infrastructure investments as well as special construction charges.

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- **Flexible Infrastructure Needs the Appropriate Service Delivery Model for Schools and Libraries:** The E-Rate program should place a value on services that can support fluctuations or spikes in network usage, such as those around standard testing intervals for K-12 schools, without requiring schools and libraries to over-provision connectivity to meet specific requirements of these flash events. Through effective aggregation and management, such as that provided by the R&E Networks, providers can work with schools to recognize when sustained network use increases over time require bandwidth upgrades. The E-Rate program should incent increased circuit commitment in a cost-effective, incremental fashion as schools and libraries demonstrate the demand for it while recognizing that we must also work within the limits of existing capabilities of commercially available equipment solutions which support specific connection types, e.g. 10 Mbps, 100 Mbps or 1000 Mbps connections.

- **Network Quality Counts for Schools and Libraries:** While the capacity of the connection is important in achieving the goals of digital learning, the quality of the connection is just as important to achieving our broadband goals for schools and libraries. Schools and libraries need reliable, dedicated connections in order to utilize learning applications. Not only is network uptime critical, but also symmetrical connections (same speed up/down), full committed information rates, low network latency (the amount of time required for a data packet to get from point A to point B) and jitter (variability in the timing of data packet arrival). These are all vital to supporting e-Learning initiatives such as distance learning, videoconferencing, on-line testing and are important to consider when evaluating the value of broadband connection. A few examples provided below highlight the types of applications commonly used by schools and libraries and how quality of service and speed impact the use of each.

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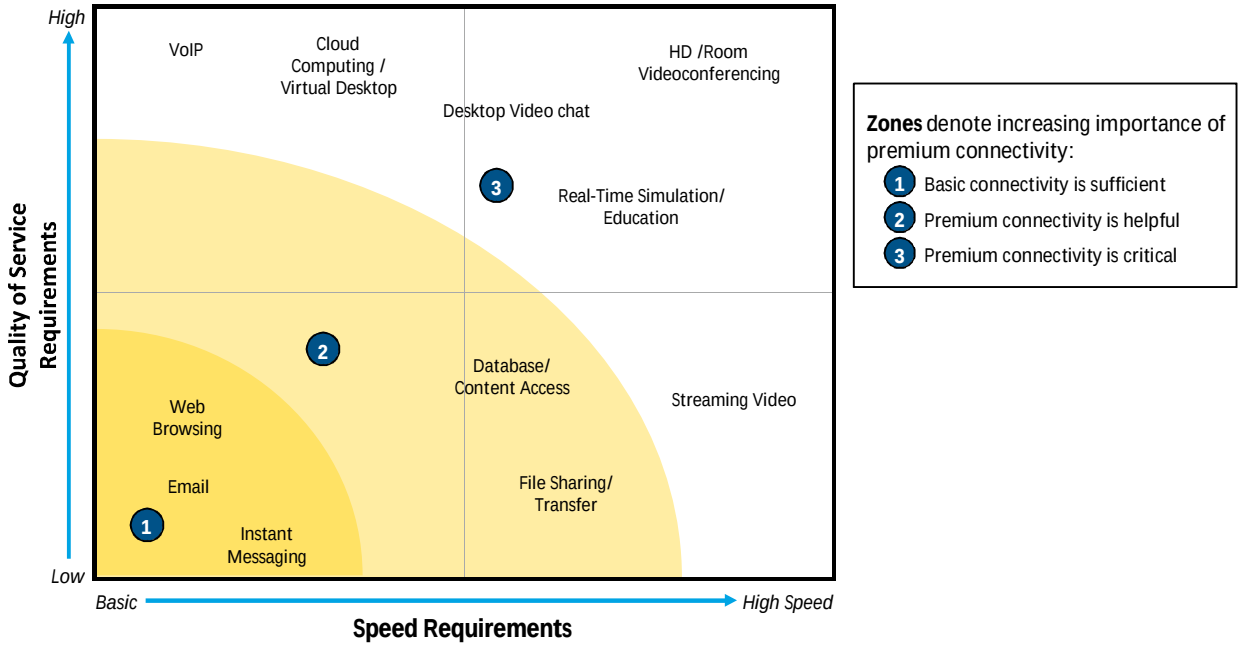
Schools

Network latency is especially important with high-definition video applications such as those used for remote classrooms and distance learning. A high latency connection, one which delays or drops packets, will make real-time communications look and sound jittery, distorted, or garbled. Voice and video communications become choppy and unsynchronized. Video frame rates may drop.

When schools do not receive the full throughput of their broadband connection, on-line testing data may compete with administrative data which may compete with classroom instruction data at any given point during an academic day. This contention results in packet delay and loss while requiring additional technical resources to help plan for and prioritize network use.

Libraries

Source: Bill and Melinda Gates Foundation Study "Connections, Capacity, and Community: Exploring Potential Benefits of Research and Education Networks for Public Libraries", February 2011.



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- **Bandwidth Must Reach the Users:** It is not enough that there is a high capacity connection to the edge of the school network. This type of bandwidth must be accessible in the classroom where instruction and learning occurs. If a school is able to gain access to affordable connectivity to each building, but does not have the resources to purchase equipment to utilize the upgraded services and disburse the connectivity throughout the building to the classrooms, then the benefit of the capacity investment goes unfulfilled. A modernized E-Rate program should recognize the importance of internal connections through committed, recurring program funds.

- **Education Does Not End at 3 PM:** E-Rate reform must address home connectivity for underserved students in some tangible way. Building upon the FCC's extended school hour program and allowing a strategy where the school or library becomes an after-hours hot spot by inviting a commercial provider to share the school's E-Rate funded infrastructure are two possible strategies.

- **Consortia Applications Yield Pricing Improvements and Greater Efficiencies:** The knowledge, experience and relationships held by consortium applications such as the R&E networking community promotes partnerships with a range of service providers and results in lower pricing to schools and libraries than they would be able to negotiate independently. The opportunity for a larger volume, multi-site contract which lowers administrative costs for the provider is frequently the incentive for providers to bid on more of the individual sites of a consortium application rather than just a single opportunity. Based on a site-by-site evaluation of responses, consortia determine the best technology and value for the particular site and in doing so, awards contracts to multiple vendors. The benefits of consortium purchases extend into technical support where consortium buyers often get higher priority in technical support. Consortium buyers often get access to flexibly priced last mile circuits that allow connectors to grow into higher bandwidth commitments in an economical and efficient fashion.

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